TEKTRONIX CRT HISTORY

Part 1. The Early Years

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Until 1954, Tektronix purchased all of its CRTs from three major OEM suppliers - RCA, Du Mont, and Sylvania. These were off-the-shelf, RMA-registered tubes. Of course, all of these were given their own Tektronix part numbers which were used for in-plant inventory control and replacement part ordering by customers. This first article will describe the purchased CRTs, their numbering, and usage in the early Tektronix oscilloscope models. This period of time extended from 1947 into the mid-1950s for most purchased CRTs and, in one case, the mid-1960s.

THE 5CP-A

The venerable curved-face 5CP1-A was the standard CRT installed in the 511 oscilloscopes which were introduced in 1947. The 511 was the first Tektronix oscilloscope and was a result of Howard Vollum's World War II experience in radar. He saw a great need for an oscilloscope with precision measurement capability for post-war research in the expanding fields of radar, television, nucleonics, medicine, and electronics. The widely used Du Mont oscilloscopes ("oscillographs" in Du Mont terminology) and CRTs of the 1930s and 1940s were somewhat lacking in this ability.

The 5CP1-A used in the original 511 continued to be standard in the improved model 511A oscilloscopes up through serial number 5099. It was also supplied in the model 514D introduced in 1950 up to the about 1953, when the 514-AD was introduced. According to one EIA (formerly RMA) list, the 5CP1 (Figure 1) was registered by the RMA JTC-6 CRT Committee in 1942. The sponsor was reported in another EIA list as RCA. Although the original data sheet used for registration was typewritten and the outline drawing hand drawn, this appears very likely. Later CRT registrations used manufacturers' preliminary data sheets and listed the manufacturer rather than the committee registering it. The 5CP7 data sheet registered at the same time is marked "Government Restricted" due to its wartime use of P7 phosphor for radar. The improved 5CP1-A having a "zero focus current" electron gun was registered by RCA in 1945. As a point of interest, I reviewed the updated 5CP1-A/5CP1-B/5CP12 MIL specifications (MIL-PRF-1/273J) in 1998 for the Department of

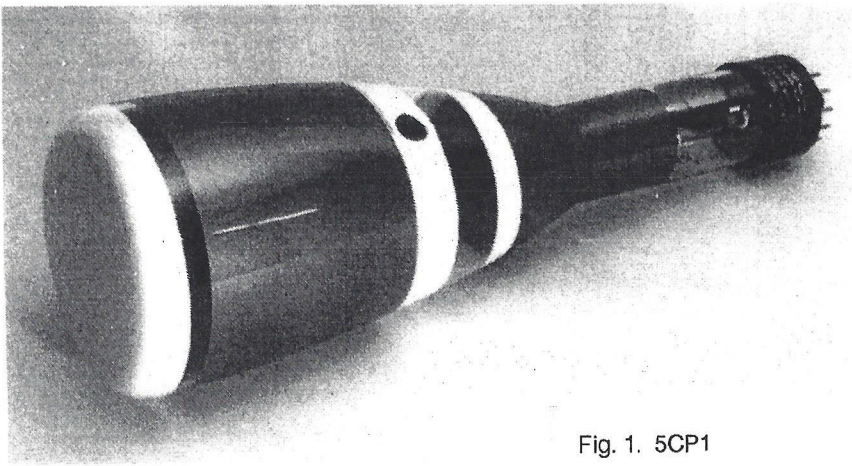

Fig. 1. 5CP1

Defense, and it is presumably still an active tube type, since no change notice has been received to move it to inactive status in the mean_time.

The 5CP1-A was purchased only from RCA, according to surviving Tektronix records, although most CRT manufacturers included it in their product lines at that time. Instruments with long-persistence P7 and short-persistence P11 phosphors were also available on special order. The CRTs supplied in them were the RCA 5CP7-A and 5CP11-A. The model 512, introduced in 1949, used the long-persistence 5CP7-A as standard through s/n 2524, with P1 and P11 available as options.

THE 5ABP-

In 1952, RCA introduced the 5ABP1 CRT, which was very similar to the 5CP1-A except that it had a flat face to reduce measurement error due to parallax with the external plastic graticules in use at that time. It also had approximately double the vertical deflection sensitivity. This reduced the vertical amplifier gain required and made it easier to achieve instrument bandwidth specifications. P7 and P11 phosphors were

Advertisement, *Electronics*, Jan. 1954

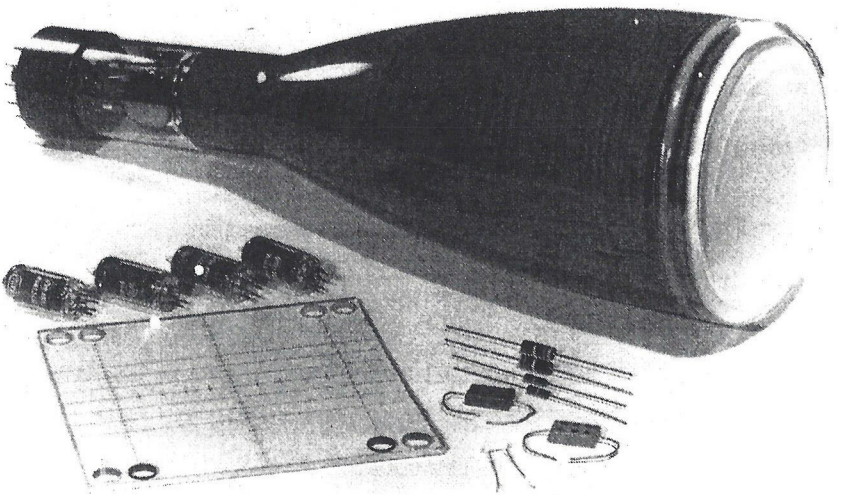

Fig. 2. Modification kit for 514, close-up

also available using the 5ABP7 and 5ABP11. Tektronix quickly changed to the improved tube for the models 511A, 512, and the new 514AD. Modification kits (Figure 2) were produced to upgrade older instruments. Other parts were included in the kits, such as a new graticule, resistors, capacitors, inductors, and even four 6AU6s for the vertical amplifier in the case of the kit for the 514.

In 1953 Tektronix introduced its first oscilloscope, the 524-D, devoted exclusively to television measurements. This instrument also used the 5ABP1 as the standard CRT. P7 and P11 were available as optional choices.

THE 5XP-

Another OEM 5-inch CRT purchased by Tektronix starting in 1950 was the Du Mont 5XP- series of high-performance CRTs (Figure 3), used in early model 513 oscilloscopes through serial number 1887 and in the model 517. This tube, registered with RMA by Du Mont in 1948, operated at very high accelerating voltage, 12 kV in the 513 and 24 kV in the 517, for high brightness, and was capable of displaying high-speed transients. With its approximately 50 MHz bandwidth, the 517 was pretty much state-of-the-art for its time. The CRTs were available in three versions; the 5XP1 (for general purpose applications), 5XP2 (for longer persistence), and the 5XP11 (for photo-recording of fast events). The 517 was catalogued with the 5XP11 as standard according to the 1952 Tektronix catalog with P1 and P2 optional. The 5XP2 was shipped as standard in the 513 with P1 and P11 being optional, according to the

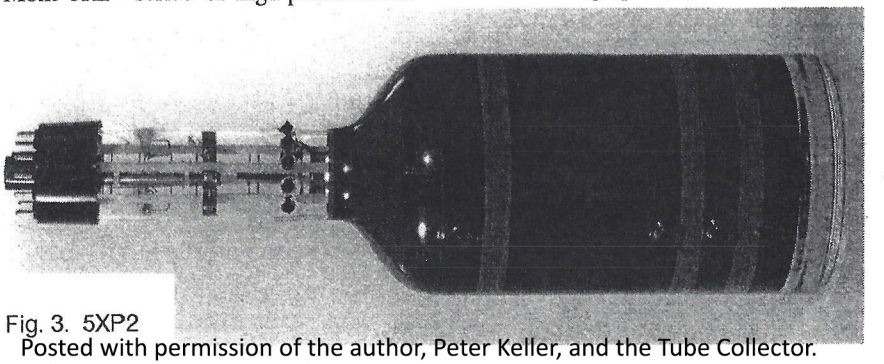

Fig. 3. 5XP2

same catalog. The 1950 catalog just lists all three as available in the 513 without specifying what is standard. Conflicting information exists in the May 1967 Cathode-Ray Tube by Instrument cross reference list. It lists the 5XP1-B, 5XP2-B, and 5XP11-MB under the above part numbers. Since the "B": version, which has a metalized screen, was registered with RTMA (formerly RMA) by Du Mont in December of 1952, it couldn't have been used in the early instruments. Probably it was added under the old p/n after that date to provide improved performance.

The 5XP- was a major factor influencing the decision by Tektronix to design and manufacture its own CRTs. Due to difficulty meeting instrument specifications, a comparison was made of tubes received through the company's regular purchasing channels and some acquired anonymously. It was found that Du Mont, a major oscilloscope competitor and the principal manufacturer of high-performance CRTs, was shipping their marginal CRTs to that upstart, Tektronix, in an apparent effort to maintain the Du Mont lead (at that time) in oscilloscopes. A similar situation existed with CRTs purchased from RCA, which also manufactured oscilloscopes. These problems resulted in a major and strenuous effort by Tektronix to begin manufacturing for its own use. Ultimately, it led to many significant advances in CRT design by Tektronix that led to the eventual end of Du Mont as a major player in the oscilloscope game. Du Mont struggled along for several years and was acquired by Fairchild in the early 1960s. They were never able to regain market share and it was Hewlett-Packard that eventually gave Tektronix some competition in the 1960s and 1970s. This wasn't all bad, as it kept Tek from becoming complacent after its early successes.

THE 3WP-

The remaining purchased CRT, the 3-inch flat-face monoaccelerator 3WP- (Figure 4), was undoubtedly used in far greater quantities by Tektronix beginning in 1954 and for much longer than any other of the others previously described. This was in spite of the fact that Tektronix was an established CRT manufacturer in its own right by then. The 3WP- was used in four versions; the 3WP1, 3WP2, 3WP7, and 3WP1. By the mid-1950s, the wide range of linear time-base sweeps demanded use of a longer persistence phosphor than that of the P1 phosphor previously used in most oscilloscopes. P2 permitted the full benefits of the slower sweep speed portion of the range. It is fairly efficient with good brightness, fairly long persistence at least in subdued light, and good resistance to burning at slow sweep speeds. Its green color is also a good match to the maximum sensitivity of the human eye. The 3WP2 became the standard CRT in the model 310 announced in 1955, 310A of 1959 (up to s/n 17372), model 315D of 1953 and model 360 of 1955 (up to s/n 2576) instruments. The 3WP2 remained standard until about 1964 when Tektronix had caught up enough on high-performance CRT designs to introduce a similar tube of its own, the T310-P2. The 3WP- is a pretty basic tube as CRTs go so the priority to convert from OEM tubes was low. The handy-

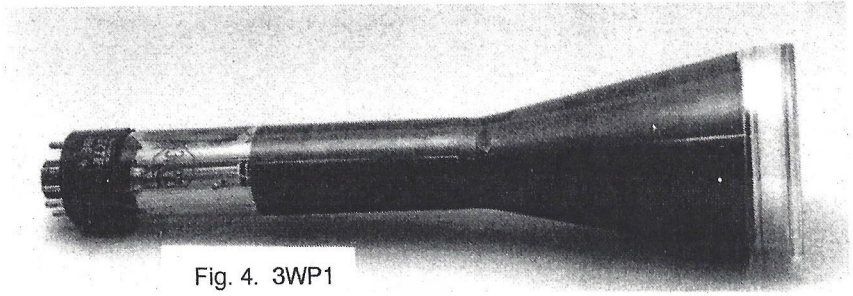

Fig. 4. 3WP1

TUBE	MODEL	INTRO	S/N RANGE	P1	P2	P7	P11
3WP-	310	1955	101-10000	154-058	154-059*	154-060	154-061
"	310A	1959	10001-17372	"	"	"	"
"	315	1953	ALL	"	"	"	"
"	360	1955	101-2576	"	"	"	"
5CP-A	511	1947	ALL	154-062*	N/A	154-063	154-064
"	511A	1948	455-5099	"	"	"	"
"	512	1949	101-2524	154-062	N/A	154-063*	154-064
"	514D	1950	ALL	154-062*	N/A	154-063	"
5XP-	513	1950	101-1887	154-065	154-066*	N/A	154-067
"	517	1950	101-925	"	154-066	"	154-067*
5ABP-	511A	1950	5100-END	154-068*	N/A	154-069	154-070
"	512	1949	2525-END	154-068	N/A	154-069*	"
"	514AD	1953	ALL	154-068*	N/A	154-069	"
"	524D	1954	ALL	"	"	"	"
"	524AD	ca1957	ALL	"	"	"	"

* Denotes phosphor normally supplied

Table 1. Tektronix part numbers for purchased CRTs

sized 310A, now with the Tektronix T310 CRT, remained in the catalog up to 1971 and was very popular. 3WP-s were purchased from RCA, Sylvania, and Du Mont. The 3WP- was registered with RTMA in 1952 by RCA.

TEKTRONIX PART NUMBERS

Many cathode-ray tube type and part numbers have been used since the introduction of the Tektronix 511 oscilloscope in 1947. Because of evolutionary changes in CRT design as well as changes in the Tektronix part numbering systems, several hundred pages of cross-reference lists between instrument type number, CRT type number, and part number exist. Adding to the confusion are the many phosphor and internal graticule variations that were used later. The Tektronix part number during the early years consisted of two groups of three digits separated by a hyphen (example: 154-062). The first three numbers denotes the category of part such as resistor, capacitor, vacuum tubes, etc. CRTs were included in the 154- prefix group for vacuum tubes. Variations observed on the two three-digit groups include omitting the hyphen to make it a single six-digit number (example: 154062) in instruction manuals printed in the late 1950s and the later addition of a letter suffix (example: 154-062A), presumably added to denote production changes or improvements. The latter is found in an internally published p/n cross reference list from 1967 that included early CRTs. The purchased tubes themselves were marked only with the customary RMA type number. Table 1 lists the Tektronix part numbers assigned to purchased CRTs.

COMING NEXT:

The story of Tektronix' shift from a user of off-the-shelf CRTs to a manufacturer of its own precision T51 CRT will be covered in Part 2, "The First Tek CRTs."

REFERENCES:

Keller, Peter A., The Cathode-Ray Tube, Palisades Press, 1991.

Griffiths, Stan, Oscilloscopes, Selecting and Restoring a Classic (, 1992.

Lee, Marshal M., Winning with People: The First 40 Years of Tektronix, Tektronix, 1986.

Tektronix instrument catalogs.

Tektronix internal publications of instrument/CRT/part number cross reference lists, 1962-1989.